5.0 Nogales $PM_{2.5}$ / PM_{10} Nonattainment Areas Case Study

5.1 Purpose and Organization of the Case Study

The Nogales $PM_{2.5}$ / PM_{10} Nonattainment Areas Case Study (The Case Study) outlines a sample regional conformity analysis and the supporting documentation for analysis year 2008. This documentation and emissions analysis is based on data provided by ADOT and is meant to be illustrative only. The analysis and documentation should be updated as necessary to reflect real-world conditions for any future conformity analyses. Areas where updates are required are [contained in brackets and highlighted].

The Case Study is organized into the following sections, which would be found in a typical regional conformity analysis:

1) **Introduction:** Includes information on the nonattainment or maintenance area, background on transportation conformity and the applicable national ambient air quality standards (NAAQS), as well as a status update on the TIP and LRTP.
2) **Interagency Consultation:** Outlines interagency consultation requirements and includes a tabulation of all decisions made through interagency consultation.
3) **Analysis Methodology and Data:** This section outlines all of the technical steps taken to conduct the conformity analysis and includes details on MOVES and AP-42 inputs and methodologies.
4) **Transportation Control Measures (TCMs):** This section outlines any TCMs that have been specifically identified and committed to in State Implementation Plans. Timely implementation of TCMs must be demonstrated before conformity determinations can be made.
5) **Conformity Analysis Results:** Building upon the methodology and data described in the previous sections, this section documents the actual results by emissions test and analysis year.
6) **Conformity Determination:** The final result of the conformity analysis, which includes documentation demonstrating financial constraint, public participation, and the conformity statement.
7) **Resources:** Lists of informational websites and guides, particularly with respect to the MOVES model.
8) **Attachments:** The attachments contain additional detail including the project list, detailed emission results, interagency consultation materials and checklist, and sample run specifications for MOVES.

5.2 Introduction

This report provides an analysis of the air quality implications of the current [SouthEastern Arizona Governments Association (SEAGO)] Transportation Improvement Program (TIP) and the [Arizona Department of Transportation (ADOT) Statewide Transportation Improvement Program (STIP)] and Long-Range Transportation Plan (LRTP). This analysis demonstrates transportation conformity for the [Nogales] nonattainment area (NA) for the [2006, 24-hour fine particulate matter ($PM_{2.5}$) and 1987 coarse particulate matter (PM_{10})] National Ambient Air Quality Standards (NAAQS). The air quality conformity analysis reflects regionally significant, non-exempt transportation projects included in the TIP / [STIP and Statewide] LRTP. [Since there is no metropolitan planning organization (MPO) associated with the planning process in the Nogales NA, ADOT and the Arizona Department of Environmental Quality (ADEQ) coordinated the conformity process closely with SEAGO and local representatives.]

5.2.1 Background on Transportation Conformity

Transportation conformity is required by the CAA (Section 176 (c)) to ensure that federal funding and approval are given to highway and transit projects that are consistent with the area's air quality goals. Demonstrating conformity means verifying that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.

Regional conformity, or the conformity of a plan or TIP, demonstrates that the total emissions from an area's transportation system are consistent with goals for air quality found in the SIP, i.e., they are less than or equal to the motor vehicle emission budgets (MVEBs) (§93.118). If an area does not have adequate or approved MVEBs another test, known as the interim emissions test (§93.119), must be performed. The interim emissions tests include either demonstrating that the emissions predicted in the "action" scenario are not greater than the emissions predicted in the "baseline" scenario or by demonstrating that the emissions predicted in the "action" scenario are not greater than the emissions in the baseline year for a given NAAQS.

The transportation conformity determination includes an assessment of future fugitive dust and on-road, highway emissions for defined analysis years including the end year of the LRTP. Emissions are estimated using the latest available planning assumptions and available analytical tools, including the Environmental Protection Agency's (EPA's) latest approved on-highway mobile sources emissions model. The conformity determination includes a tabulation of the analysis results for applicable pollutants demonstrating that the required conformity test was met for each analysis year.

5.2.2 National Ambient Air Quality Standards

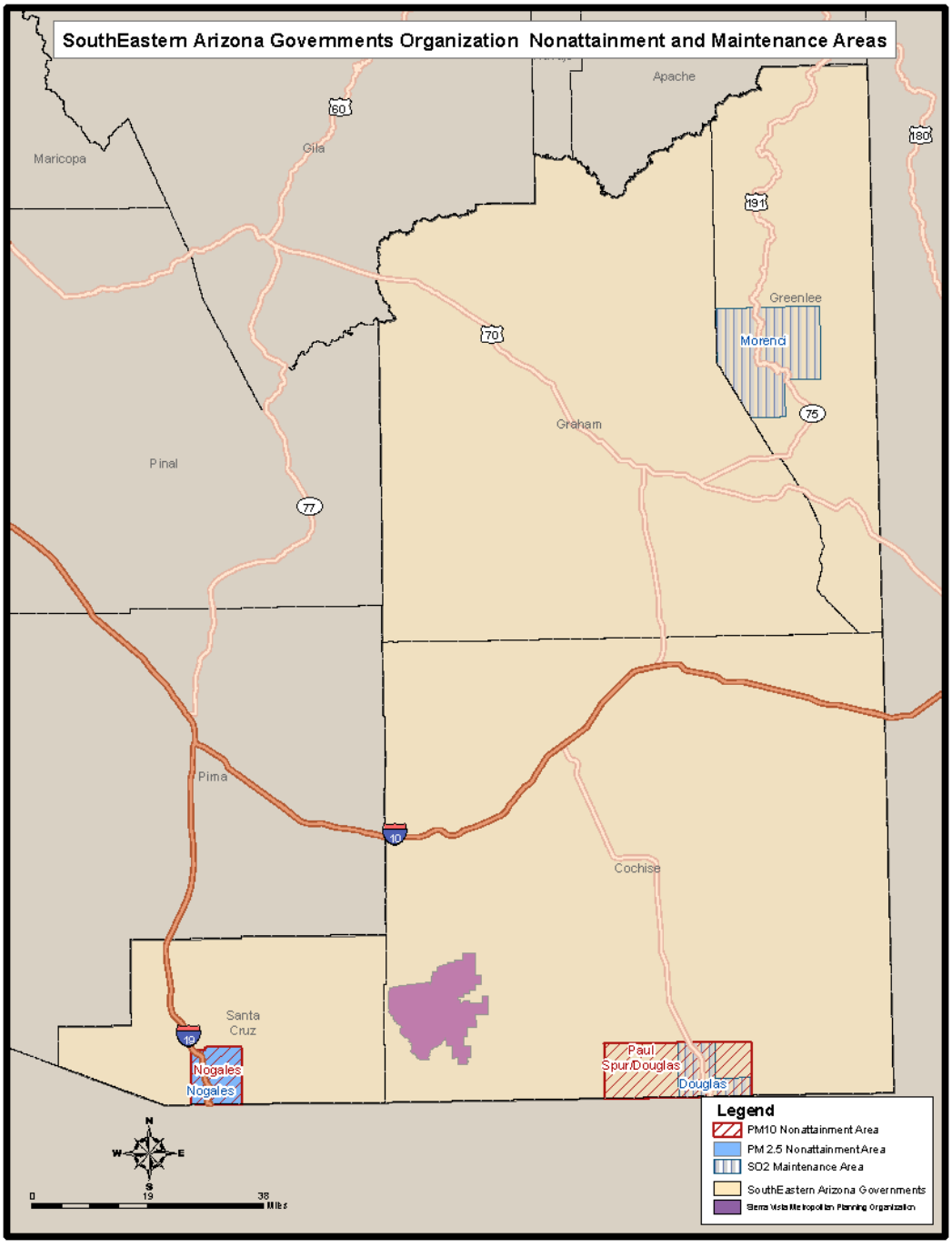
The CAA requires EPA to set NAAQS for pollutants considered harmful to public health and the environment. A nonattainment area is any area that does not meet the national primary or secondary NAAQS. A maintenance area is any area that the EPA previously designated as a nonattainment area for one or more pollutants, and subsequently redesignated as an attainment area following the fulfillment of the requirement to develop a maintenance plan under section 175A of the CAA. The [Nogales] area has been designated as [nonattainment] under the [$PM_{2.5}$ and PM_{10}] NAAQS. Transportation conformity requires nonattainment and maintenance areas to demonstrate that the implementation of planned and programmed transportation projects will not prevent the area from reaching its attainment goals.

Particle pollution (also called particulate matter or PM) is the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope.

Particle pollution includes "inhalable coarse particles," with diameters larger than 2.5 micrometers and smaller than 10 micrometers and "fine particles," with diameters that are 2.5 micrometers and smaller. These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some particles, known as primary particles, are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires. Others form in complicated reactions in the atmosphere of chemicals such as sulfur dioxides and nitrogen oxides that are emitted from power plants, industries and automobiles. These particles, known as secondary particles, make up most of the fine particle pollution in the country.

Effective on December 18, 2006, the EPA tightened the 24-hour $PM_{2.5}$ standard from 65 µg/m³ to 35 µg/m³, and retained the current 1987 24-hour PM_{10} standard at 150 µg/m³. Figure 5-1 illustrates the air quality status in the SEAGO region for the 1987 PM_{10} and 2006 $PM_{2.5}$ NAAQS. On December 14, 2012, EPA issued a revised $PM_{2.5}$ annual NAAQS of 12 µg/m³. This was published in Federal Register on January 15, 2013 and was effective March 18, 2013. Nonattainment designations have not yet been issued under this new NAAQS, therefore conformity to this NAAQS is not yet applicable.

Figure 5-1: SEAGO Nonattainment and Maintenance Areas Map



[$PM_{2.5}$

The Nogales area was designated as nonattainment under the 2006 24-hour $PM_{2.5}$ standard. Effective February 6, 2013, the EPA took final action to determine that the Nogales NA attained the 2006 $PM_{2.5}$ standard (see Table 5-1). The finding did not constitute a redesignation of the Nogales NA to attainment; the classification and designation status remain nonattainment until such time as EPA determines that Arizona has met the CAA requirements for redesignating the Nogales nonattainment area to attainment.

At this time, the Nogales $PM_{2.5}$ NA does not have adequate or approved MVEBs, and will therefore use the interim conformity test for the 24-hour $PM_{2.5}$ standard. According to the EPA Final Rule for the 24-hour $PM_{2.5}$ standard, prior to the approval of SIP budgets, $PM_{2.5}$ areas may use either the "build-no-greater-than-no-build" test or the "no-greater-than 2008" test. Following interagency consultation, the Nogales area used the "no-greater-than-2008" test for 24-hour $PM_{2.5}$ direct emissions and $PM_{2.5}$ precursors. The only $PM_{2.5}$ precursor that is required to be analyzed is NOx.

The pollutant sources to be analyzed in the conformity analysis are:

[1] Direct $PM_{2.5}$ emissions (exhaust emissions, brake and tire wear),
[2] Re-entrained road dust, and
[3] Precursors NOx.

Until a SIP is established, the EPA has ruled that, unless the EPA or the State's Division of Air Quality finds otherwise, direct $PM_{2.5}$ emissions and NOx are the only emissions that must be analyzed for transportation conformity (§93.119).]

[PM_{10}

The Nogales area was designated as a nonattainment area under the 1987 24-hour PM10 standard, which was retained under the EPA's 2006 PM NAAQS review (effective December 18, 2006). The EPA approved the Nogales 2012 PM10 nonattainment area SIP; "Final 2012 State Implementation Plan Nogales PM10 Nonattainment Area," effective October 25, 2012 (see Table 5-1). As part of that process, EPA approved the MVEBs and the demonstration that the Nogales nonattainment area is attaining the NAAQS, but for international emission sources in Nogales, Mexico.]

[Table 5-2 illustrates the EPA-approved MVEBs which must be used for transportation conformity determinations.]

Table 5-1: [Nogales Area] Nonattainment and Maintenance Areas and Current SIP Status by Pollutant

County	Current SIP Status[1]	Notes *(as of February 1, 2013)*
Nogales, AZ 24-Hour $PM_{2.5}$ Nonattainment Area		
Santa Cruz (P)	Attainment Finding Effective 2/6/2013 78 FR 887	Area remains nonattainment until a Maintenance Plan is submitted and approved. Regional conformity still applies.
Nogales, AZ 24- Hour PM_{10} Moderate Nonattainment Area		
Santa Cruz (P)	2012 SIP Approval Effective 10/25/2012 77 FR 58962	EPA approved the plan element demonstrating that the Nogales nonattainment area is attaining the NAAQS for PM10, but for international emissions sources in Nogales, Mexico.

Table 5-2: [2011] Nogales Nonattainment Area PM_{10} Motor Vehicle Emissions Budgets

Sector	PM_{10} Tons per Year (tpy)
Dust – Unpaved Road Dust	864.9
Dust – Paved Road Dust	121.4
Dust – Road Construction	26.0
Mobile – Gasoline and Diesel (Including Exhaust, Brake and Tire Wear)	21.0
2011 MVEB	**1274.3**

5.2.3 Status of the FY [2013-2017 TIP and 2035] Long Range Plan

The [2013-2017] SEAGO TIP was approved by the executive committee on [May 31, 2012] and the ADOT LRTP was adopted by the Arizona State Transportation Board on [November 18, 2011]. The SEAGO TIP was submitted to the United States Department of Transportation (US DOT) on [Date] and was approved on [Date].

5.3 Interagency Consultation

As required by the Federal transportation conformity rule (§93.105), the conformity process includes a significant level of cooperative interaction among federal, state, and local agencies. For this air quality conformity analysis, interagency consultation was conducted as required by the Arizona Conformity SIP. Conference call(s) or meeting(s), involving ADOT, ADEQ, EPA, FHWA, FTA, [representatives from SEAGO and other Interagency Consultation Group members] were conducted on [Date(s)] to review all input planning assumptions, methodologies and analysis years. Table 5-3 summarizes the key decisions made by the interagency consultation group.

Table 5-3: Interagency Consultation Decisions

Item	Decision
Traffic Forecasts	Use of statistical relationships based on historic HPMS VMT trends and future county socioeconomic projections.
EPA Emission Model(s)	[MOVES2010b and EPA's AP-42]
Regionally Significant Projects, Projects with a Significant Change in Design Concept and Scope	As shown in TIP and Plan listing, and project coding.
Transportation Control Measures (TCM) Progress	[Pave or Chemically Stabilize Unpaved Roads; Pave, Vegetate or Chemically Stabilize Access Points Where Unpaved Traffic Surfaces Adjoin Unpaved Roads.]
Exempt Projects	Notification of transportation plan or TIP amendments which merely add or delete exempt projects listed in §93.126 or §93.127.
Triggers for Conformity	[New or revised TIP or LRTP. NAAQS designation grace period. Other.]
24-Hour $PM_{2.5}$ Conformity Test	Analysis for [Nogales Nonattainment Area] Use [interim "No Greater Than 2008"] emission test Analysis Years: [2008], [Year2], [Year3], [Year4]
24-Hour PM_{10} Conformity Test	Analysis for [Nogales Nonattainment Area] Compare to EPA-Approved 2011 SIP MVEBs Analysis Years : [2008], [Year2], [Year3], [Year4]
Analysis Years	Analysis years (by pollutant/precursor) as shown in this report.
Boundary Issues	MPO, RPO, nonattainment and maintenance area boundaries as stated in this report.
Project Identification	All regionally significant, non-exempt projects, regardless of funding source, have been identified and included in this analysis.
Design Scope	The design scope of projects under development is as stated or modeled in this analysis.
Latest Planning Assumptions	As stated in this report, including: fleet age data, I/M program, fuels used, environmental data, and other MOVES inputs (see MOVES input summary).

5.4 Analysis Methodology and Data

This transportation conformity analysis was conducted using EPA's Motor Vehicle Emission Simulator (MOVES) model to estimate on-road emissions and EPA's AP-42 methodologies to estimate fugitive dust impacts including paved and unpaved road dust. The methodologies used for this analysis are consistent with those used to develop SIP inventories. Since no substantial road construction projects have taken place in the last five years, and no projects are planned for the next five years, estimates for this category represent a conservative, worst-case scenario, not actual emissions.

5.4.1 On-Road Analysis Background

MOVES represents a state-of-the-art upgrade to EPA's modeling tools. It is the EPA-approved model required for estimating emissions from highway vehicles, replacing the MOBILE6.2 model. EPA announced the release of MOVES2010 in March 2010 (75 FR 9411), and released a minor revision as MOVES2010a in September 2010. In April 2012, EPA released MOVES2010b to allow MOVES users to benefit from several improvements to general model performance. MOVES2010b does not affect the criteria pollutant emissions results of MOVES2010a and therefore is not considered a new model.

This analysis utilizes available traffic, vehicle fleet, and environmental data to estimate regional on-road emissions. Air quality conformity analyses must use the most recent planning assumptions that are available at the start of the analysis. Areas are encouraged to review and update their planning assumptions and strive towards regular 3-year updates of planning assumptions, especially population, employment and vehicle registration assumptions.

The analysis methodology and data inputs were developed through interagency consultation and using available EPA guidance documents including:

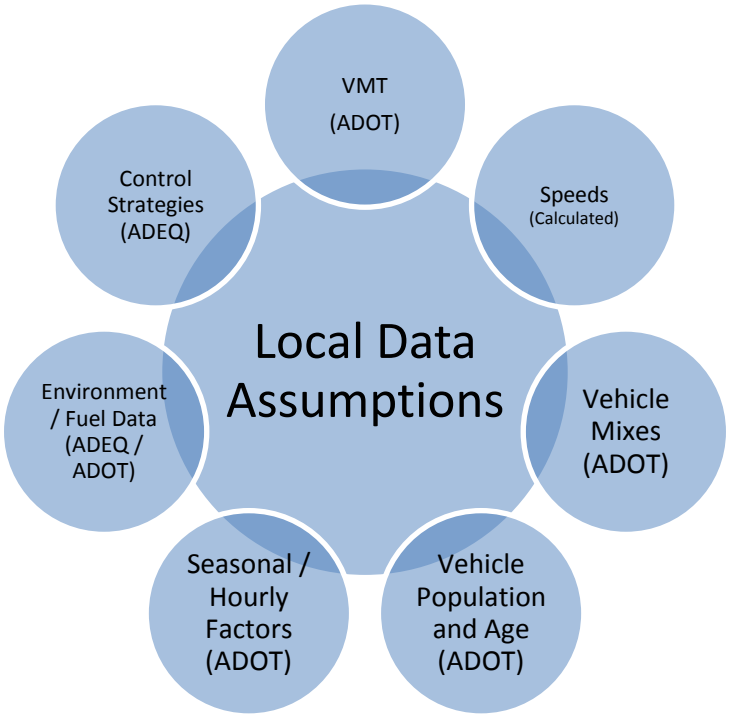
- Policy Guidance on the Use of MOVES2010 and Subsequent Minor Revisions for SIP Development, Transportation Conformity, and Other Purposes, US EPA Office of Air and Radiation, EPA-420-B-12-010, April 2012.
- Using MOVES to prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, 2010a and 2010b. US EPA Office of Air and Radiation, and Office of Transportation and Air Quality, EPA-420-B-12-028, April 2012.
- Motor Vehicle Emission Simulator, User Guide Version, MOVES2010b, EPA-420-B-12-001, March 2012.

The methodologies used to produce the emissions data conform to the recommendations provided in EPA's technical guidance. A mix of local and national default (internal to MOVES) data are used in the analysis. As illustrated in Figure 5-2, local data have been used for the primary data items that have a significant impact on emissions including vehicle miles of travel, vehicle population, congested speeds, vehicle type mix and environmental and fuel assumptions. Local data inputs to the analysis process reflect the latest available planning assumptions using information obtained from the ADOT, ADEQ and other local/national sources.

The methodology used for this analysis includes the use of traffic data from ADOT's statewide travel demand model and custom post-processing software (PPSUITE) to calculate hourly speeds and prepare key traffic input files to the MOVES emission model. PPSUITE consists of a set of programs that perform the following functions:

- Analyze highway operating conditions.
- Calculate highway speeds.
- Compile vehicle miles of travel (VMT) and vehicle type mix data.
- Prepare MOVES runs and processes MOVES outputs.

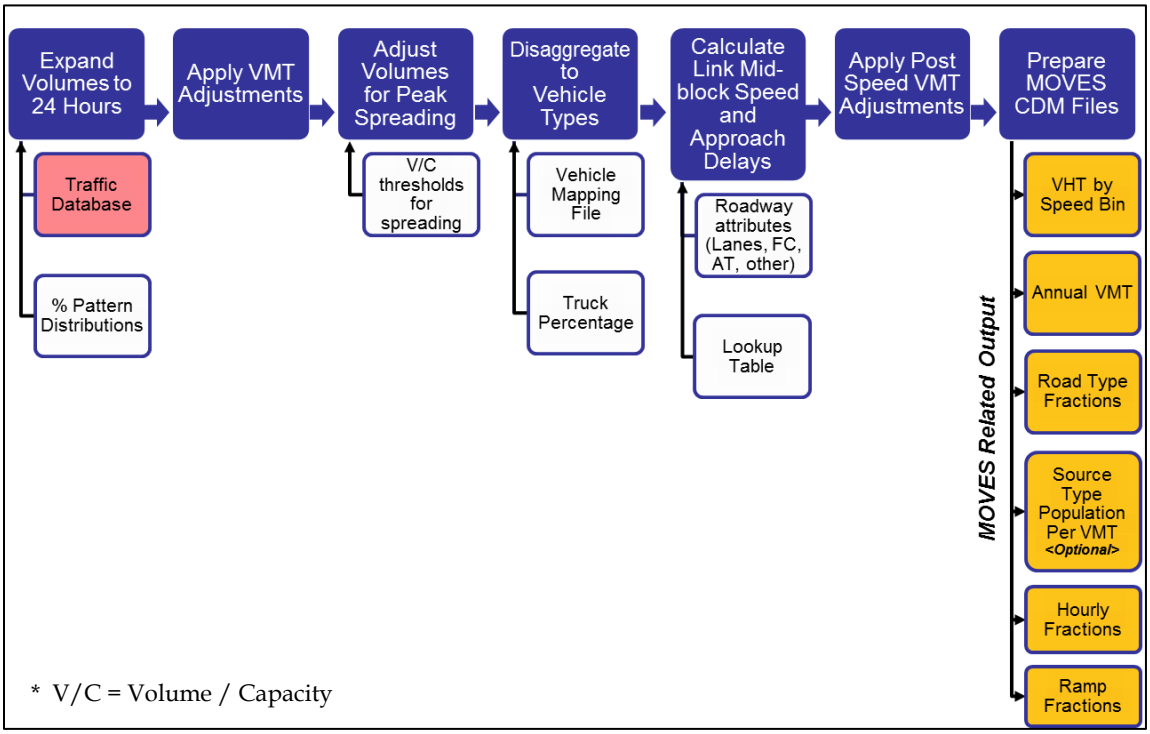
Figure 5-2: Local Data Inputs Used for Conformity Runs



PPSUITE is a widely used and accepted tool for estimating speeds and processing emissions rates. It has been used for SIP highway inventories, control strategy analyses, and conformity analyses in other states. The software is based upon accepted transportation engineering methodologies. The PPSUITE process is integral to producing traffic-related input files to the MOVES emission model. Figure 5-3 summarizes the key functions of PPSUITE within the emission calculation process. Other MOVES input files are prepared external to the PPSUITE software. These include vehicle population, vehicle age, environmental, and fuel input files.

The CENTRAL software is also used in this analysis. CENTRAL is a menu-driven software platform that executes the PPSUITE and MOVES processes in batch mode. The software allows users to execute runs for a variety of input options and integrates custom MYSQL steps into the process. CENTRAL provides important quality control and assurance steps including file naming and storage automation.

Figure 5-3: Emission Calculation Process



5.4.2 Key MOVES Input Data

A large number of inputs to MOVES are needed to fully account for the numerous vehicle and environmental parameters that affect emissions. These include traffic flow characteristics, vehicle descriptions, fuel parameters, inspection/maintenance program parameters, and environmental variables. MOVES includes a default national database of meteorology, vehicle fleet, vehicle activity, fuel, and emission control program data for every county; but EPA cannot certify that the default data represent the most current or best available information for any specific area. As a result, local data are recommended for use in conformity analyses, where available. A mix of local and default data are used for this analysis. These data items are discussed in the following sections.

Roadway Data Inputs

The traffic data from the statewide travel model are used to prepare PPSUITE-ready network databases. Key tasks to develop these databases included:

- Reformatting the traffic data to extract data fields needed for PPSUITE processing. Data reformatting can be accomplished in Microsoft ACCESS, EXCEL, or other database software such as FoxPro.
- Adding a ROADTYPE variable to support MOVES runs based on a mapping scheme between the model facility type and the MOVES road types.
- Separation of traffic data into two input databases to account for AB and BA directions.

Figure 5-4 summarizes the statewide model data used to prepare the network databases for the PPSUITE process. Traffic volumes and distances are used in calculating highway VMT totals for the [Nogales NA] area. Adjustments are needed to convert the volumes to an average annual daily traffic (AADT) which will be discussed later. Lane values are an important input for determining the congestion and speeds for individual

model links. Facility type and area type are important indicators of the type and function of each roadway segment and are also used to create the ROADTYPE variable added to the network database as discussed above.

Figure 5-4: Statewide Model Data Used for Preparing Network Database

Field Type	Use
Length	To compute VMT for each segment
Facility Type	Lookup of other link attributes (e.g. capacities, signal characteristics, congested speed curve coefficients)
Area Type	
Speed Limit	Free-flow speed
Lanes	To determine total capacity of link
Daily Volume	Daily volume to distributed to each hour of the day
AM Peak Period Volume	Adjust hourly pattern to ensure match with model peak volumes
PM Peak Period Volume	
Daily Truck Volume	Adjust vehicle mix pattern to match truck volume on each link
Roadtype	Used to aggregate data for input to MOVES

Hourly Pattern Data/Hour VMT Fractions

Speeds and emissions vary considerably depending on the time of day. Therefore, it is important to estimate the pattern by which roadway volume varies by hour. Pattern data are in the form of a percentage of the daily volumes for each hour and was developed by each facility type grouping for Santa Cruz County. The hourly pattern input file in PPSUITE format is prepared based on the traffic volume pattern data from ADOT. The same factors are also used to develop the MOVES hourly fraction file.

Vehicle Type Mix

Emission rates within MOVES vary significantly by the type of vehicle. The MOVES model produces emissions and rates by thirteen MOVES vehicle source types. However, VMT is input to MOVES by six HPMS vehicle groups. Figure 5-5 summarizes the distinction between each classification scheme.

Figure 5-5: MOVES Source Types and HPMS Vehicle Groups

SOURCE TYPES	
11	Motorcycle
21	Passenger Car
31	Passenger Truck
32	Light Commercial Truck
41	Intercity Bus
42	Transit Bus
43	School bus
51	Refuse Truck
52	Single Unit Short-haul Truck
53	Single Unit Long-haul Truck
54	Motor Home
61	Combination Short-haul Truck
62	Combination Long-haul Truck

HPMS Class Groups	
10	Motorcycle
20	Passenger Car
30	Passenger/Light Truck
40	Buses
50	Single Unit Trucks
60	Combination Trucks

For this case study, vehicle type pattern data are developed for each facility type based on the statewide travel model outputs and internal MOVES defaults. As the first step, travel model data are used to develop percentage splits of the total volume to the following vehicle groups by facility type and time period:

- Autos
- Single Unit Trucks (SUT)
- Multiple Unit Trucks (MUT)

MOVES default VMT by HPMS vehicle type (per MOVES selection, State of Arizona) are then used to split the above vehicle groups (autos, SUT and MUT) into the six HPMS vehicle classes needed by MOVES. Figure 5-6 illustrates how the statewide model traffic is used to develop vehicle type mix. [For this case study exercise, no portion of the SUT category is assumed to be part of the MOVES light commercial truck category. Additional research and examination of the vehicles contained in this category may be necessary to determine the validity of this assumption.]

The daily truck volumes (sum of SUT and MUT) are also provided to PPSUITE to guarantee the truck volumes created by the pattern file and the vehicle mix file match the observed truck volumes specified in the network databases.

Figure 5-6: Vehicle Type Mix Preparation

VMT Data Source		MOVES Source Type Mapping	Calculate Vehile Mix Distribution
AZ Statewide Model	Auto	**Auto by MOVES Source Type** 11_Motorcycle 21_ Passenger Car 31_Passenger Truck 32_Light Commercial Truck	**Auto VMT Mix** Based on MOVES Default VMT Mix (AZ Statewide 2008 Total) Normalized by Auto Grouping [Do not vary by county & road type]
	SUT	**SUT by MOVES Source Type** 42_Transit Bus 43_School Bus 41_Intercity Bus 51_Refuse Truck 52_Single Unit Short-haul Truck 53_Single Unit Long-haul Truck 54_Motor Home	**SUT VMT Mix** Based on MOVES Default VMT Mix (AZ Statewide 2008 Total) Normalized by SUT Grouping [Do not vary by county & road type]
	MUT	**MUT by MOVES Source Type** 61_Combination Short-haul Truck 62_Combination Long-haul Truck	**MUT VMT Mix** Based on MOVES Default VMT Mix (AZ Statewide 2008 Total) Normalized by MUT Grouping [Do not vary by county & road type]

HPMS VMT Adjustments

According to EPA guidance, baseline inventory VMT computed from the regional model must be adjusted to be consistent with HPMS VMT totals. Although it has some limitations, the HPMS system is currently in use in all 50 states and is being improved under FHWA direction. [Adjustment factors are calculated which adjust the 2008 travel model VMT to be consistent with the AADT using reported 2008 HPMS totals for that year.] These factors are applied to facility group combinations within the county. These adjustments are important for accounting for missing local roadway VMT that is not represented within the regional travel model.

Fuel Inputs

The fuel inputs were developed based on local fuel supply and fuel formulation data as prepared by ADOT and ADEQ.

Vehicle Population Inputs

Vehicle population is a key input that has an important impact on start and evaporative emissions. Vehicle population data was developed from state registration data. [For the Nogales NA, the population is estimated by applying a factor to the county population. The factor is calculated by dividing the VMT in Nogales NA by the VMT in Santa Cruz County].

Other Inputs Used Directly from ADOT Sample Files

The following MOVES input files are used directly from ADOT sample files for Santa Cruz County:

- Day VMT Fractions
- Month VMT Fractions
- Meteorology Inputs

5.4.3 MOVES Analysis Process Details

This section describes how PPSUITE and MOVES use input data to produce emission estimates. Figure 5-7 provides a more detailed overview of the PPSUITE analysis.

VMT Preparation

Producing an emissions inventory with PPSUITE requires a process of disaggregation and aggregation. Data are available and used on a very detailed scale – individual roadway segments for each of the 24 hours of the day. These data need to be processed individually to determine the distribution of vehicle hours of travel (VHT) by speed and then aggregated by vehicle class to determine the input VMT to the MOVES emission model. Key steps in the preparation of VMT include:

- *Assemble VMT* – The network databases, prepared from the statewide travel model data as described above, contain the roadway segments, distances and travel volumes needed to estimate VMT. The PPSUITE software processes each segment by simply multiplying the assigned travel volume by the distance to obtain VMT.
- *Disaggregate to Hours* - The traffic volumes are split into each hour of the day. This allows for more accurate speed calculations (effects of congested hours) and allows PPSUITE to prepare the hourly VMT and speeds for input to the MOVES model.
- *Peak Spreading* - After dividing the daily volumes to each hour of the day, PPSUITE identifies hours that are unreasonably congested. For those hours, PPSUITE then spreads a portion of the volume to other hours within the same peak period, thereby approximating the "peak spreading" that normally occurs in such over-capacity conditions. This process also helps prevent the generation of hours with unreasonably congested speeds that may impact emission calculations.
- *Disaggregation to Vehicle Types* - EPA requires VMT estimates to be prepared by the six HPMS vehicle groups, reflecting specific local characteristics. As described previously, the hourly volumes are disaggregated to the thirteen MOVES source types based on data from the travel model and MOVES defaults. The thirteen MOVES source types are then recombined to the six HPMS vehicle classes.
- *Apply HPMS VMT Adjustments* - Volumes must also be adjusted to account for differences with the HPMS VMT totals, as described previously. VMT adjustment factors are provided as inputs to

PPSUITE, and are applied to each of the roadway segment volumes. [The 2008 HPMS adjustment factors developed for the Santa Cruz County are also applied to the Nogales area.]

Speed Estimation

Emissions for many pollutants vary significantly with travel speed. To calculate speeds, PPSUITE first obtains initial capacities (how much volume the roadway can serve before heavy congestion) and free-flow speeds (speeds assuming no congestion) from the speed/capacity lookup data. This data table contains default roadway information indexed by the area and facility type codes. For areas with known characteristics, values can be directly coded to the database and the speed/capacity data can be overridden. The result of this process is an estimated average travel time for each hour of the day for each highway segment. The average time multiplied by the volume produces VHT.

Developing the MOVES Traffic Input Files

The PPSUITE software is responsible for producing the following MOVES input files during any analysis run:

- VMT by HPMS vehicle class
- VHT by speed bin
- Road type distributions
- Hourly VMT fractions
- Ramp fractions

These files are text formatted files with a *.csv extension. The files are provided as inputs within the MOVES County Data Manager (CDM) and are described below:

- *VMT Input File* – VMT is the primary traffic input that affects emission results. The roadway segment distances and traffic volumes are used to prepare estimates of VMT. PPSUITE performs these calculations and outputs the MOVES annual VMT input file to the CDM. The annual VMT is computed by multiplying the travel model AADT by 365 or 366 days in a leap year.

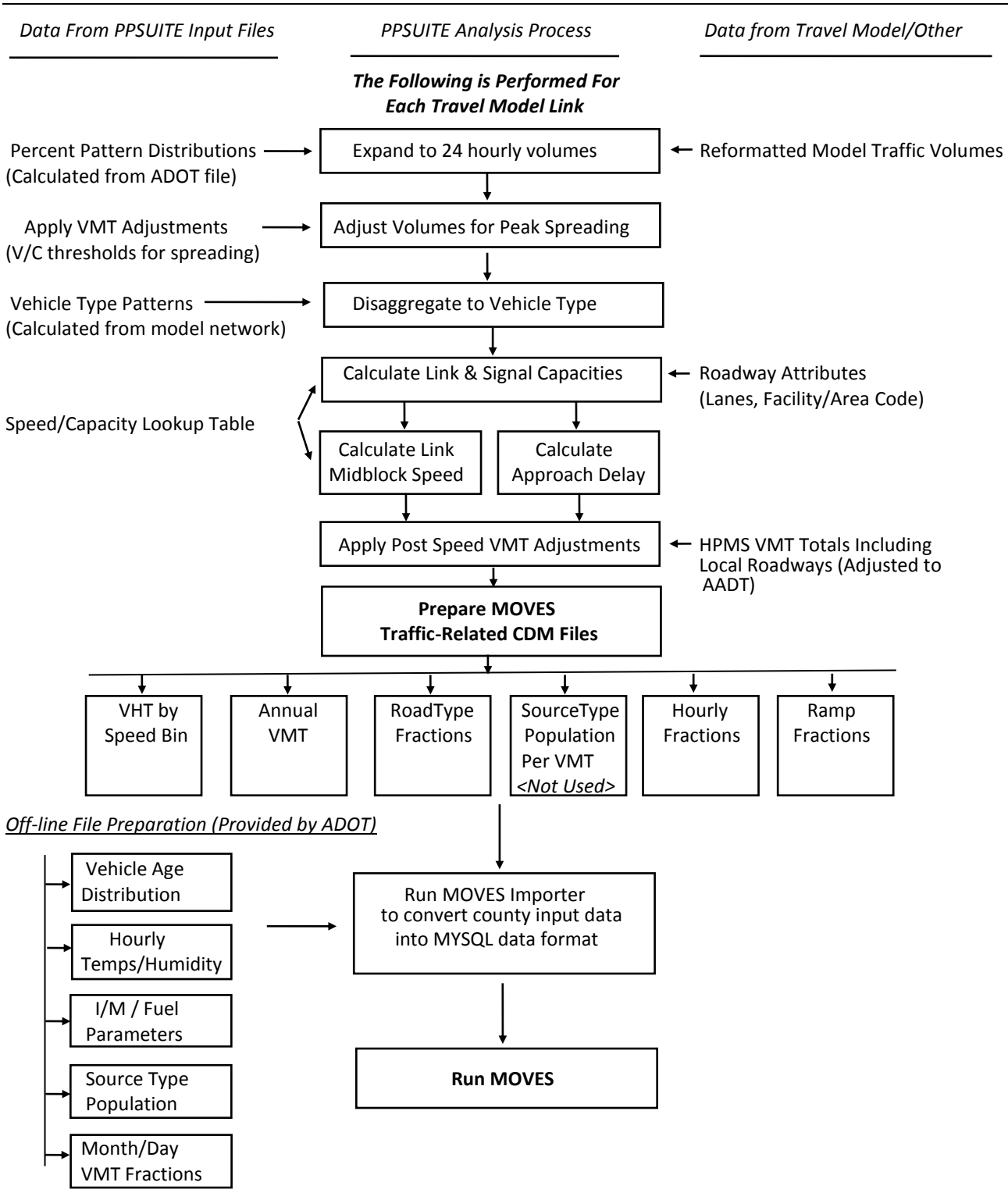
- *VHT by Speed Bin File* – The PPSUITE software prepares the MOVES VHT by speed bin file which summarizes the distribution of speeds across all links into each of the MOVES speed bins for each hour of the day by road type. This robust process ensures that MOVES emission rates are used to the fullest extent and are consistent with the methods and recommendations provided in EPA's technical guidance.

- *Road Type Distributions* – In MOVES, typical drive cycles and associated operating conditions vary by the type of roadway. MOVES defines five different road types as follows:
  1 Off-Network
  2 Rural Restricted Access
  3 Rural Unrestricted Access
  4 Urban Restricted Access
  5 Urban Unrestricted Access

  For this analysis, the MOVES road type distribution file is automatically generated by PPSUITE using defined equivalencies. The off-network road type includes emissions from vehicle starts, extended idle activity, and evaporative emissions. Off-network activity in MOVES is primarily determined by the Source Type Population input.

- *Ramp Fractions* – The Arizona statewide travel model has separate facility classes (urban and rural) for ramps. As a result, PPSUITE assembles ramp VMT for these links and prepares the Ramp Fraction file for input to MOVES.

Figure 5-7: PPSUITE Process and Input Files Integration



MOVES Runs

After computing speeds and aggregating VMT and VHT, PPSUITE prepares traffic-related inputs needed to run EPA's MOVES software. Additional required MOVES inputs are prepared external to the processing software and include temperatures, I/M program parameters, fuel characteristics, vehicle fleet age distributions and source type population.

The MOVES county importer is run in batch mode. This program converts all data files into the MYSQL formats used by the MOVES model. At that point a MOVES run specification file (*.mrs) is created which specifies options and key data locations for the run. The MOVES model is then executed in batch mode. A summary of key MOVES run specification settings is shown in Table 5-4Table 5-4. For this analysis, MOVES is applied using the *inventory-based* approach. Under this method, actual VMT and population are provided as inputs to the model; MOVES is responsible for producing the total emissions for the region.

Table 5-4: MOVES Run Specification File Parameter Settings

Parameter	Setting
MOVES Default Database Version	[8/26/2010 or 4/10/2012]
Scale	COUNTY
Analysis Mode	Inventory
Time Span	**Annual Runs:** 12 months, Weekday and Weekend, 24 hours **July Weekday Runs:** July month, Weekday, 24 hours
Time Aggregation	Hour
Geographic Selection	[Santa Cruz County / Nogales]
Vehicle Selection	All source types Gasoline, Diesel, CNG
Road Type	All road types including off-network
Pollutants and Processes	[All $PM_{2.5}$ and PM_{10} categories, NOx]
General Output	Units: Emission = grams; Distance = miles; Time = hours; Energy = Million BTU
Output Emissions	Time = Month, Emissions by Process ID, Source Type, and Road Type

5.4.4 Fugitive Dust Analyses

The arid conditions and soil composition in many areas of Arizona make fugitive dust a major contributor to regional PM_{10} and, to a lesser extent, $PM_{2.5}$ levels. Fugitive dust was determined through interagency consultation to be a significant factor in the [Nogales PM_{10} SIP], requiring that re-entrained road dust from paved roads, unpaved roads and fugitive dust from roadway construction activities be considered in subsequent air quality planning efforts.

The methods used to calculate fugitive dust emissions are consistent with the MVEB methodologies contained in the SIP and with EPA's AP-42 methodologies.

Paved Roadway Emissions

Paved roadway fugitive dust emissions were calculated using the MOVES-based VMT estimates documented in this analysis and the following methodology and assumptions,[consistent with the Nogales NA SIP]:

Emissions Factor is $E = [k (sL)^{0.91} \times (W)^{1.02}] (1 - P/4N)$

Annual Emissions Reduction = Roadway VMT_{Annual} * E

Where:

E = Annual or other long-term average emission factor in the same units as k,

k = Particle size multiplier for particle size range and units of interest

- PM_{10}: 1.0 g/VMT,
- $PM_{2.5}$: 0.25 g/VMT

sL = Road surface silt loading [(0.105 g/m^2 ADEQ Nogales PM_{10} SIP)]

W = Average weight (tons) of the vehicles traveling the road (3 tons)

P = Number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period For precipitation a value of 60 days/365 days per year is the value presented in the AP-42 references for the region containing [Nogales]; ADEQ used 45 days in nonattainment plan (conservative).

N = Number of days in the averaging period (e.g., 365 for annual)

Emissions Factor

$E = [k (sL)^{0.91} \times (W)^{1.02}] (1 - P/4N)$

$E = [1(0.105)^{0.91} \times (3)^{1.02}](1-(45)/(4 \times 365)$

E = 0.38225 g/VMT

Unpaved Roadways

The main contributor to the fugitive dust inventory was re-entrained dust from unpaved roads. Unpaved road emission factors were calculated for a range of possible surface material silt contents within the [Nogales NA] using a low surface material silt content value of 2.90 percent and a high surface material silt content value of 7.50 percent per EPA recommendation.

Unpaved roadway fugitive dust emissions were calculated using the MOVES-based VMT estimates documented in this analysis and the following methodology and assumptions, consistent with the [Nogales NA] SIP:

Emission factor is $E = ([k(s/12)^a(S/30)^d] / [(M/0.5)^c]) - C$

Where:

E = PM_{10} emission factor (lb/VMT) = 0.248 lb/VMT (low value) & 0.642 lb/VMT (high value)

k = Empirical Constant = 1.8 lb/VMT (EPA AP-42 Chapter 13.2.2, 2006)

s = surface material silt content (%) = 2.90 % and 7.50 % (recommended by EPA and based on the Mexican NEI – 2004 and the Mexicali Emission Inventory - 2005).

M = Surface material moisture content (%) = 5.23 % (No reliable surface soil moisture measurements are known for the area. Therefore, the average 2 inch depth soil moisture from Walnut Gulch, AZ NRCS Site

2026 for the year of 2008 of 4.30% was adjusted for [Nogales, AZ] based on the average annual difference in rainfall between the two locations of 21.5% [Balling, 1988])

S = Mean vehicle speed (mph) = 25 mph (Based on the typical unpaved road speed limit in Arizona)
a = Empirical Constant = 1 (EPA AP-42 Chapter 13.2.2, 2006)
c = Empirical Constant = 0.2 (EPA AP-42 Chapter 13.2.2, 2006)
d = Empirical Constant = 0.5 (EPA AP-42 Chapter 13.2.2, 2006)
C = 0.00047 lb/VMT (EPA AP-42 Chapter 13.2.2, 2006)

This emission factor is then corrected to only account for non-rainy days:
E_{est} = E[(365-P)/ 365]

Where:
E_{est} = Annual size-specific emission factor extrapolated for natural mitigation (lb/VMT) = 0.217 lb/VMT (low value) & 0.563 lb/VMT (high value)
E = The unadjusted emission factor = 0.248 lb/VMT (low value) & 0.642 lb/VMT (high value)
P = Number of days in a year with at least 0.254 mm (0.01 in) of precipitation = 45 days (EPA AP-42 Figure 13.2.2-1., 2006)

E_{low} = VMT* E_{est} / 2000 lb/ton
E_{high} = VMT* E_{est} / 2000 lb/ton

[*Road Construction*
Based on documentation in the SIP and the current TIP, there have been no substantial road construction projects in the Nogales NA in the last five years and no projects are planned for the next five years; therefore, estimates for this category represent a conservative worst-case scenario, not actual emissions. This methodology was determined appropriate through interagency consultation.]

5.4.5 Transportation Control Measures

[There is one transportation control measure in the SIP:

- Pave or Chemically Stabilize Unpaved Roads; Pave, Vegetate or Chemically Stabilize Access Point Where Unpaved Traffic Surfaces Adjoin Paved Roads

The TCM is continuing to be implemented in a timely manner and none of the projects in the TIP or LRTP interfere with the implementation of the TCM.

Paving of unpaved roadways is the single most effective control measure available to reduce re-entrained road dust. The emissions reductions resulting from the implementation of this TCM were calculated using the following methodology and assumptions, consistent with the Nogales NA SIP:

Daily Emission Reductions = (BEF – AEF) * Miles * 0.93 * ADT * 1 /1000 (Kg/day)

Where:
BEF = The PM10 emission factor for vehicles traveling on unpaved roads or alleys
AEF = The PM10 emission factor for vehicles traveling on paved roads

Miles = The length of the project (in centerline miles)
ADT = The average weekday traffic on the unpaved road or alley
0.93 = The factor to convert from weekday to annual average daily traffic on arterials.
0.25 = The factor to convert from PM_{10} to $PM_{2.5}$.

5.5 Conformity Analysis Results

A transportation conformity analysis of the current TIP and LRTP has been completed for the [Nogales NA]. The analyses were performed according to the requirements of the federal transportation conformity rule 40 CFR Part 93, Subpart A. The PM_{10} analysis was performed in accordance with 40 CFR 93.118 (Criteria and procedures: Motor vehicle emissions budget). The $PM_{2.5}$ analysis was conducted pursuant to 40 CFR 93.119 (Criteria and procedures: Interim emissions in areas without motor vehicle budgets). The analysis utilized the methodologies, assumptions and data as presented in previous sections. Interagency consultation has been used to determine applicable emission models, analysis years and emission tests.

5.5.1 Emission Tests

[The PM_{10} conformity analysis was conducted to evaluate emissions in comparison to the applicable MVEBs summarized in Table 5-5. The budgets were established using the MOVES emission model.]

Table 5-5: [2011] Nogales Nonattainment Area PM_{10} Motor Vehicle Emissions Budgets

Sector	PM_{10} Tons per Year (tpy)
Dust – Unpaved Road Dust	864.9
Dust – Paved Road Dust	121.4
Dust – Road Construction	26.0
Mobile – Gasoline and Diesel (Including Exhaust, Brake and Tire Wear)	21.0
2011 MVEB	**1274.3**

[There are currently no approved SIP budgets for the Nogales 24-hour $PM_{2.5}$ NA. Until budgets are developed by ADEQ and found adequate by EPA, the area must continue to demonstrate conformity to the interim emission test (§93.119). Per the interagency consultation process, the interim emission test has been defined as: the "no-greater-than 2008" test. The analysis has been conducted for direct $PM_{2.5}$ emissions (exhaust and brake/tire wear), the precursor NO_x and re-entrained road dust (paved and unpaved road dust).]

5.5.2 Analysis Years

EPA regulations, as outlined in Sections §93.118(c) and §93.119(g) of the Final Transportation Conformity Rule, require that emissions analyses be conducted for specific analysis years as follows:

- Each year for which the applicable implementation plan specifically establishes a MVEB(s)
- A near-term year, one to five years in the future (applicable in areas without budgets).
- The last year of the LRTP's forecast period.
- Attainment year of the standard if within timeframe of TIP and LRTP.
- An intermediate year or years such that analysis years are no more than ten years apart.

All analysis years were determined through the interagency consultation process. Table 5-6 provides the analysis years used for this conformity analysis.

Table 5-6: Transportation Conformity Analysis Years

Analysis Year	Description	Applicable To 24-Hour PM_{10}	Applicable To 24-Hour $PM_{2.5}$
[2008]	Base Year for Interim Conformity Test	[Yes/No]	[Yes/No]
[2011]	Near-Term Analysis Year/ Proposed Budget Year	[Yes/No]	[Yes/No]
[Year]	Interim Year/ Proposed Budget Year	[Yes/No]	[Yes/No]
[Year]	Interim Year	[Yes/No]	[Yes/No]
[Year]	Last Year of LRTP	[Yes/No]	[Yes/No]

5.5.3 Regionally Significant Highway Projects

For the purpose of conformity analysis, model highway networks are created for each analysis year. For the horizon years, regionally significant projects from the LRTP were coded onto the networks. Detailed assessments were only performed for those new projects which may have a significant effect on emissions in accordance with 40 CFR Parts 51 and 93. Essentially, only those projects which would increase capacity or significantly impact vehicular speeds were considered. Projects such as bridge replacements and roadway restoration projects, which constitute the majority of the TIP and LRTP list, have been excluded from consideration since they are not expected to significantly alter the volume or speed of traffic. A list of highway projects is shown in **Attachment A**. [There are no air quality significant transit TIP/LRTP projects in the region.]

5.5.4 Analysis Results

An emissions analysis has been completed for the [2006 24-Hour PM_{10} and $PM_{2.5}$ NAAQS]. The results of the analysis are summarized in the tables below. A detailed emission summary is also provided in **Attachment B**. A summary of MOVES input parameters is provided in **Attachment C**. Example MOVES importer (XML) and run specification (MRS) files are provided in **Attachment D**.

[Table 5-7 summarizes the PM_{10} emission results for a summer weekday in each analysis year. The summer weekday was converted to an annual value by multiplying by 315.38 days/year to match the annual budgets in the SIP. The [Year], [Year], [Year] and [Year] analysis years are compared to the [2011] and [Year] budgets. The table illustrates that all years satisfy the conformity PM budget test.]

Table 5-8 summarizes the 24-hour $PM_{2.5}$, NOx, and road dust emissions for summer weekday conditions. Emissions are compared against a 2008 baseline estimate. The table illustrates that all future analysis year emissions are below the 2008 baseline.]

Table 5-7: 24-Hour PM_{10} Emission Analysis Results and Conformity Test
(July Weekday Converted to Tons per Year to Match SIP MVEBs)

Pollutant	*2011 MVEB (tons/year)*	*[2008 Example] (tons/year)*	*[Year] (tons/year)*	*[Year] (tons/year)*	*[Year] (tons/year)*
Dust – Unpaved Road Dust	***864.9***	*891.39*	*X.XX*	*X.XX*	*X.XX*
Dust – Paved Road Dust	***121.4***	*131.91*	*X.XX*	*X.XX*	*X.XX*
Dust – Road Construction	***267.0***	*267.00*	*X.XX*	*X.XX*	*X.XX*
Mobile Gasoline & Diesel (Exhaust Brake and Tire Wear)	***21.0***	*27.96*	*X.XX*	*X.XX*	*X.XX*
2011 MVEB	***1274.3***	*1318.26*	*X.XX*	*X.XX*	*X.XX*
TCM Emissions Benefits (Paving Unpaved Roads)		*-51.76*			
Conformity Result		**Pass**	**Pass/Fail**	**Pass/Fail**	**Pass/Fail**

Table 5-8: 24-Hour $PM_{2.5}$ Emission Analysis Results and Conformity Test
(July Weekday)

Pollutant	*2008 BASELINE (tons/day)*	*[Year] (tons/day)*	*[Year] (tons/day)*	*[Year] (tons/day)*	*[Year] (tons/day)*
Dust – Unpaved Road Dust	***0.71***	*X.XX*	*X.XX*	*X.XX*	*X.XX*
Dust – Paved Road Dust	***0.11***	*X.XX*	*X.XX*	*X.XX*	*X.XX*
Mobile $PM_{2.5}$	***0.08***	*X.XX*	*X.XX*	*X.XX*	*X.XX*
Mobile NO_x	***3.39***	*X.XX*	*X.XX*	*X.XX*	*X.XX*
Conformity Result		**Pass/Fail**	**Pass/Fail**	**Pass/Fail**	**Pass/Fail**

5.6 Conformity Determination

Financial Constraint

The federal planning regulations, Sections 450.322(b)(11) and 450.324(e), require the transportation program and plan to be financially constrained while the existing transportation system is being adequately operated and maintained. Only projects for which construction and operating funds are reasonably expected to be available are included. ADOT, in conjunction with [SEAGO], ADEQ, FHWA and FTA, has developed an estimate of the cost to maintain and operate existing roads and bridges in the [Nogales NA] and has compared that with the estimated revenues and maintenance needs of the new roads over the same period. The TIP and LRTP have been determined to be financially constrained.

Public Participation

The TIP and LRTP have undergone the public participation requirements and the comment and response requirements set forth in the Final Conformity Rule, the Final Statewide/Metropolitan Planning Rule, and

Arizona's Conformity SIP. The draft document was made available for [30-days of public review and comment] beginning on [Date].

Conformity Statement

Based on the quantitative assessment of the [SEAGO] TIP and ADOT LRTP for the [Nogales NA], it has been determined that the project elements and programmatic strategies of the TIP and LRTP conform to the [Nogales PM_{10} SIP and the $PM_{2.5}$ interim emissions test (emissions are below the 2008 baseline)].

5.7 Resources

MOVES Model

Modeling Page within EPA's Office of Mobile Sources Website contains a downloadable model, MOVES users guide and other information. (http://www.epa.gov/omswww/models.htm)

Policy Guidance on the Use of MOVES2010 and Subsequent Minor Revisions for SIP Development, Transportation Conformity, and Other Purposes, US EPA Office of Air and Radiation, EPA-420-B-12-010, April 2012.

Using MOVES to prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, 2010a and 2010b. US EPA Office of Air and Radiation, and Office of Transportation and Air Quality, EPA-420-B-12-028, April 2012.

Motor Vehicle Emission Simulator, User Guide for MOVES2010a, EPA-420-B-10-036, August 2010.

Motor Vehicle Emission Simulator, User Guide Version, MOVES2010b, EPA-420-B-12-001, March 2012.

Traffic Engineering

Highway Capacity Manual, Transportation Research Board, presents current knowledge and techniques for analyzing the transportation system.

5.8 Glossary and Definitions

AADT: Average Annual Daily Traffic, average of ALL days.

Air Quality Concern: PM hot-spot analyses are required for projects "of local air quality concern," which include certain highway and transit projects that involve significant levels of diesel vehicle traffic and any other project identified in a PM SIP as a localized air quality concern. PM hot-spot analyses are not required for projects that are not of local air quality concern. Section 93.123 of the conformity rule contains further guidance on determining whether a project is of local air quality concern.

Attainment Area: An area considered to have air quality that meets or exceeds the EPA national ambient air quality standards, which EPA establishes according to the requirements of the Clean Air Act. An area may be an attainment area for one pollutant and a nonattainment area for others. Nonattainment areas are areas designated by EPA as not meeting a standard for a pollutant.

Carbon Monoxide (CO): A colorless, odorless, tasteless gas formed in large part by incomplete combustion of fuel. Human activities (e.g., transportation or industrial processes) are largely the source for CO contamination in ambient air.

Clean Air Act (CAA): Clean Air Act as amended in 1990.

CARB: California Air Resources Board.

CFR: Code of Federal Regulations.

CDM: County Data Manager. User interface developed to simplify importing specific local data for a single county or a user-defined custom domain without requiring direct interaction with the underlying MySQL database.

Congestion Mitigation and Air Quality Improvement Program (CMAQ): A categorical funding program under the Federal-aid Highway Program. Directs funding to projects that contribute to meeting or maintaining NAAQS in nonattainment and maintenance areas.

Emissions Inventory: A complete list of sources and amounts of pollutant emissions within a specific area and time interval.

Emission rate or factor: Expresses the amount of pollution emitted per unit of activity. For highway vehicles, usually in grams of pollutant emitted per mile driven.

EPA: Environmental Protection Agency. The Federal regulatory agency responsible for administering and the enforcement of Federal environmental laws including the Clean Air Act.

FC: Functional code, applied in data management to road segments to identify their type (freeway, local, etc.).

FHWA: Federal Highway Administration. An agency of the U.S. Department of Transportation that provides financial and technical support for constructing, improving, and preserving the highway system.

Final Rule: Current conformity guidance under the CAA.

FR: Federal Register.

FTA: Federal Transit Administration. An agency of the U.S. Department of Transportation that provides stewardship of combined formula and discretionary programs to support a variety of locally planned, constructed, and operated public transportation systems.

Growth factor: Factor used to convert volumes to future years.

Highway: A term that applies to roads, streets, and parkways, and also includes rights-of-way, bridges, railroad crossings, tunnels, drainage structures, signs, guardrails, and protective structures in connection with highways.

Hot-Spot Analysis: An estimation of likely or future localized CO and/or PM pollutant concentrations and a comparison of those concentrations to the NAAQS. Hot-spot analyses asses impacts on a scale smaller than the entire nonattainment or maintenance area, including, for example, congested roadway intersections and highways or transit terminals, and uses an air quality dispersion model to determine the effects of emissions on air quality.

HPMS: Highway Performance Monitoring System.

I/M: Vehicle emissions inspection/maintenance programs ensure that vehicle emission controls are in good working order throughout the life of the vehicle. The programs require vehicles to be tested for emissions. Most vehicles that do not pass must be repaired.

Isolated Rural Area: Areas that do not contain or are not part of any metropolitan planning area as designed under the transportation planning regulations. Isolated rural areas do not have federally required metropolitan transportation plans or TIPs and do not have projects that are part of the emissions analysis of any MPO's metropolitan transportation plan or TIP. Projects in such areas are instead included in statewide transportation improvement programs. These areas are not donut areas.

Land Use: Refers to the manner in which portions of land or the structures on them are used (i.e., commercial, residential, retail, industrial, etc.).

Lapse: A lapse means that the conformity determination(s) for a metropolitan transportation plan or TIP has expired, and thus there is no currently conforming metropolitan transportation plan or TIP.

Level of Service (LOS): This term refers to a standard measurement used by transportation officials which reflects the relative ease of traffic flow on a scale of A to F, with free-flow being rated LOS-A and congested conditions rated as LOS-F.

Maintenance Area: Any region previously designated nonattainment pursuant to the CAA Amendments of 1990 and subsequently redesignated to attainment subject to the requirement to develop a maintenance plan under section 175A of the CAA, as amended.

Metropolitan Planning Organization (MPO): The policy board of an organization created and designated to carry out the metropolitan transportation planning process.

Metropolitan Transportation Plan/TIP Amendment: A revision to a metropolitan transportation plan or TIP that involves a major change to a project included in a metropolitan transportation plan or TIP including the addition or deletion of a project or a major change in project cost, project/project phase initiation dates, or a major change in design concept or design scope (e.g., changing project termini or the number of through traffic lanes). Changes to projects that are included only for illustrative purposes do not require an amendment. An amendment is a revision that requires public review and comment, redemonstration of fiscal constraint, or a conformity determination (for those involving "non-exempt" projects in nonattainment and maintenance areas).

Metropolitan Transportation Plan/TIP Update: Making current a metropolitan transportation plan or TIP through a comprehensive review. Updates require public review and comment, a 20-year horizon year for the metropolitan transportation plan, a four-year program period for TIPs, demonstration of fiscal constraint, and a conformity determination (in nonattainment and maintenance areas).

Metropolitan Transportation Plan: The official multimodal metropolitan transportation plan addressing no less than a 20-year planning horizon that is developed, adopted, and updated by the MPO through the metropolitan transportation planning process.

Mobile Sources: Mobile sources include motor vehicles, aircraft, seagoing vessels, and other transportation modes. The mobile source related pollutants are carbon monoxide (CO), hydrocarbons (HC) or volatile organic compounds (VOCs), nitrogen oxides (NOx), and particulate matter (PM_{10} and $PM_{2.5}$).

Mode: A form of transportation such as an automobile, bus or bicycle.

Motor Vehicle Emissions Budget (MVEB): That portion of the total allowable emissions defined in the submitted or approved control strategy implementation plan revision or maintenance plan for a certain date for the purpose of meeting reasonable further progress milestones or demonstrating attainment or maintenance of the NAAQS, for any criteria pollutant or its precursors, allocated to highway and transit vehicle use and emissions.

MOVES: The latest model EPA has developed to estimate emissions from highway vehicles.

National Ambient Air Quality Standards (NAAQS): Those standards established pursuant to section 109 of the CAA. Conformity applies in areas that are nonattainment or maintenance for one or more of the NAAQS of the transportation-related pollutants: ozone, carbon monoxide, nitrogen dioxide, and particulate matter ($PM_{2.5}$ and PM_{10}).

National Environmental Policy Act (NEPA): The National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.). It is the major legislation that requires Federal actions to address potential environmental impacts.

Nitrogen Oxides (NOx): A group of highly reactive gases that contain nitrogen and oxygen in varying amounts. Many of the nitrogen oxides are colorless and odorless. NOx is formed when the oxygen and nitrogen in the air react with each other during combustion. The primary sources of nitrogen oxides are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels.

Nonattainment Area: A geographic region of the United States that the EPA has designated as not meeting the NAAQS.

Ozone (O_3): Ozone is a pollutant that is not directly emitted from transportation sources. It is a secondary pollutant formed when hydrocarbons and NOx combine in the presence of sunlight. Ozone is associated with smog or haze conditions. Although the ozone in the upper atmosphere protects us from harmful ultraviolet rays, ground-level ozone produces an unhealthy environment in which to live. Ozone is created by human and natural sources.

Particulate Matter (PM), (PM_{10}), ($PM_{2.5}$): Any material that exists as solid or liquid in the atmosphere. Particulate matter may be in the form of fly ash, soot, dust, fog, fumes, etc. Particulate matter can be of such a small size that it cannot be filtered by the nose and lungs. PM_{10} is particulate matter that is less than 10 microns in size. $PM_{2.5}$ is particulate matter that is less than 2.5 microns in size. A micron is one millionth of a meter.

Pattern data: Extrapolations of traffic patterns (such as how traffic volume on road segment types varies by time of day, or what kinds of vehicles tend to use a road segment type) from segments with observed data to similar segments.

Public Participation: The active and meaningful involvement of the public in the development of state/metropolitan transportation plans and programs.

Public Transportation: Generally refers to passenger service provided to the general public along established routes with fixed or variable schedules at published fares. Related terms include: public transit, mass transit, public transportation, urban transit and paratransit.

Regionally Significant Project: A transportation project (other than an exempt project) that is on a facility which serves regional transportation needs (such as access to and from the area outside of the region, major activity centers in the region, major planned developments such as new retail malls, sports complexes, etc., or transportation terminals as well as most terminals themselves) and would normally be included in the modeling of a metropolitan area's transportation network, including at a minimum all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel.

PPSUITE: Post-Processor for Air Quality, a set of programs that estimates speeds and processes MOBILE emission rates.

Road Type: Functional code, applied in data management to road segments to identify their type (rural/urban highways, rural/urban arterials, etc.).

Source Type: One of thirteen vehicle types used in MOVES modeling.

State Implementation Plan (SIP): A SIP is the State air quality plan for meeting the NAAQS. It is a compilation of legally enforceable rules and regulations prepared by a State or local air quality agency and submitted by the State's governor to EPA for approval. A SIP is designed to achieve better air quality by attaining, making progress toward attaining, or maintaining the NAAQS.

Transportation Conformity: Process to assess the compliance of any transportation plan, program, or project with air quality implementation plans. The conformity process is defined by the Clean Air Act and regulated by the conformity rule.

Transportation Control Measures (TCMS): Any measure that is specifically identified and committed to in the applicable implementation plan, including a substitute or additional TCM that is incorporated into the applicable SIP through the process established in the CAA section 176(c)(8), that is either one of the types listed in section 108 of the CAA, or any other measure for the purpose of reducing emissions or concentrations of air pollutants from transportation sources by reducing vehicle use or changing traffic flow or congestion conditions. Notwithstanding the first sentence of this definition, vehicle technology-based, fuel-based, and maintenance-based measures which control the emissions from vehicles under fixed traffic conditions are not TCMs for the purposes of transportation conformity.

Transportation Improvement Program (TIP): A prioritized listing/program of transportation projects covering a period of four years that is developed and formally adopted by an MPO as part of the metropolitan transportation planning process, consistent with the metropolitan transportation plan, and required for projects to be eligible for funding under Title 23 USC and Title 49 USC Chapter 53.

U.S. Department of Transportation (DOT): The principal, direct, Federal funding agency for transportation facilities and programs. Includes the Federal Highway Administration, the Federal Transit Administration, the Federal Railroad Administration (FRA), and others.

Urbanized Area: An urbanized: area is a statistical geographic entity designated by the Census Bureau, consisting of a central core and adjacent densely settled territory that together contain at least 50,000 people, generally with an overall population density of at least 1,000 people per square mile.

VHT: Vehicle hours traveled.

VMT: Vehicle miles traveled. In modeling terms, it is the simulated traffic volumes multiplied by the link length.

Volatile Organic Compounds (VOCs): VOCs come from vehicle exhaust, paint thinners, solvents, and other petroleum-based products. A number of exhaust VOCs are also toxic, with the potential to cause cancer.

ATTACHMENT A

Project List

The following TIP/LRTP air quality significant highway projects are included in this analysis:

[Insert Project List]

ATTACHMENT B

Detailed Emission Results

Detailed On-Road Emission Results for 24-hour Analysis [Sample]

Road Type	Vehicle Mile of Travel (VMT)	Source Type Population (VPOP)	Vehicle Hours of Travel (VHT)	Average Speed (mph)	PM2.5 Emissions (tons/day)	PM10 Emissions (tons/day)	NOX Emissions (tons/day)
	2008 Summer Day						
Off-Road	-		-	-	0.012	0.013	0.79
Rural Restricted Access	46,794		632	74.0	0.004	0.005	0.16
Rural UnRestricted Access	98,275		1,900	51.7	0.005	0.006	0.21
Urban Restricted Access	200,586		2,980	67.3	0.021	0.023	0.75
Urban UnRestricted Access	659,130		19,490	33.8	0.039	0.055	1.48
Off Network Emission Benefits	-		-	-	0.000	0.000	0.00
TOTAL	***1,004,785***	***59,314***	***25,002***	***40.2***	***0.081***	***0.102***	***3.39***

Detailed On-Road Emission Results for Annual Analysis [Sample]

Road Type	Vehicle Mile of Travel (VMT)	Source Type Population (VPOP)	Vehicle Hours of Travel (VHT)	Average Speed (mph)	PM2.5 Emissions (tons/year	PM10 Emissions (tons/year)	NOX Emissions (tons/year)
	2008 Annual						
Off-Road							
Rural Restricted Access	14,757,736		199,359	74.0	1.34	1.47	51.79
Rural UnRestricted Access	30,994,063		599,122	51.7	1.48	1.85	66.83
Urban Restricted Access	63,260,886		939,833	67.3	6.67	7.35	236.21
Urban UnRestricted Access	207,876,504		6,146,904	33.8	12.23	17.29	466.02
Off Network Emission Benefits	-			-	-	-	-
TOTAL	***316,886,804***	***59,314***	***7,885,217***	***40.2***	***21.72***	***27.96***	***820.85***

Detailed Paved Road Baseline Emission Results [Sample]

Particle Size Multiplier (k)	Road Surface Silt Loading (sL) (g/m^2)	Average Weight of Vehicles (W)	Number of Wet Days (P)	Number of Days in Averaging	$PM_{2.5}/PM_{10}$ Ratio
0.0022	0.105	3	45	365	0.25

Emissions Factor Calculation $E = [k (sL)^{0.91} \times (W)^{1.02}] (1 - P/4N)$

PM_{10} Emission Factor (E_{ext}) (lbs/VMT)	$PM_{2.5}$ Emission Factor (E_{ext}) (lbs/VMT)	lb to grams Conversion Factor	PM_{10} Emission Factor (E_{ext}) (g/VMT)	$PM_{2.5}$ Emission Factor (E_{ext}) (g/VMT)
0.000841	0.000210	453.592	0.381450	0.095362

Annual PM_{10} Re-entrained Dust Emissions: Roadway $VMT_{Annual} \times E_{ext}$

Road Name	$RoadwayVMT_{Annual}$	x	Emissions Factor (E_{ext}) (g/VMT)	=	Annual Emissions (kg/year)	Annual Emissions (tons/year)
Road 1	313,717,936	x	0.3814500	=	119,667.70	131.91

Annual $PM_{2.5}$ Re-entrained Dust Emissions: Roadway $VMT_{Annual} \times E_{ext}$

Road Name	$RoadwayVMT_{Annual}$	x	Emissions Factor (E_{ext}) (g/VMT)	=	Annual Emissions (kg/year)	Annual Emissions (tons/year)
Road 1	313,717,936	x	0.0954	=	29,916.92	32.98

Emissions Factor is $E = [k (sL)^{0.91} \times (W)^{1.02}] (1 - P/4N)$

Annual Emissions Reduction = Roadway VMT_{Annual} * E

Where:

E	=	Annual or other long-term average emission factor in the same units as k
k	=	particle size multiplier for particle size range and units of interest = 0.0022 lbs/VMT (Table 13.2.1-1 from AP-
sL	=	Road surface silt loading – 0.105 g/m2 ADEQ Nogales PM_{10} SIP
W	=	Average weight (tons) of the vehicles traveling the road – 3 tons
P	=	Number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period. For precipitation a value of 60 days/365 days per year is the value presented in the AP-42 references for the region containing Nogales, ADEQ used 45 days in nonattainment plan.
N	=	Number of days in the averaging period (e.g., 365 for annual)

Detailed Unpaved Road Baseline Emission Results [Sample]

	% Road Surface Silt Loading (s)	% Road Surface Moisture Content(M)	Mean Vehicle Speed (MPH)	Number of Wet Days (P) (>=0.254mm)	Number of Days in Averaging Period	$PM_{2.5}/PM_{10}$ Ratio
Low Estimate	2.9	5.23	25	45	365	0.25
High Estimate	7.5	5.23	25	45	365	0.25

	Empirical Constant (k) (lb/VMT)	Empirical Constant (a)	Empirical Constant (c)	Empirical Constant (d)	Empirical Constant (C) lb/VMT
	1.8	1	0.2	0.5	0.00047
	1.8	1	0.2	0.5	0.00047

PM_{10} Emissions Factor Calculation

	Unadjusted Emissions Factor (E) lb/VMT	Number of Wet Days (P) (>=0.254mm)	PM_{10} Adjusted Emissions Factor (E_{est}) lb/VMT	lb to grams Conversion Factor	PM_{10} Adjusted Emissions Factor (E_{est}) g/VMT
Low Estimate	0.248	45	0.21728	453.592	98.558
High Estimate	0.642	45	0.56259	453.592	255.188

Annual PM_{10} Emissions: Roadway VMT_{Annual} x E_{ext}

Road Name	$RoadwayVMT_{Annual}$	x	PM_{10} Emissions Factor (E_{ext})	=	Annual Emissions (kg/year)	Annual Emissions (tons/year)
Low Estimate	3,168,868	x	98.558	=	312,317.37	344.27
High Estimate	3,168,868	x	255.188	=	808,656.80	891.39

Annual $PM_{2.5}$ Emissions: Roadway VMT_{Annual} x E_{ext}

Road Name	$RoadwayVMT_{Annual}$	x	$PM_{2.5}$ Emissions Factor (E_{ext})	=	Annual Emissions (kg/year)	Annual Emissions (tons/year)
Low Estimate	3,168,868	x	24.640	=	78,079.34	86.07
High Estimate	3,168,868	x	63.797	=	202,164.20	222.85

Emissions Factor = $([k(s/12)^a(S/30)^d] / [(M/0.5)^c]) - C$

Where:

E	=	the unadjusted emission factor (lb/VMT)
E_{est}	=	annual size-specific emission factor extrapolated for natural mitigation (lb/VMT)
s	=	surface material silt content (%) = 2.90 % and 7.50 % (recommended by EPA and based on the Mexican NEI – 2004 and the Mexicali Emission Inventory - 2005).
M	=	surface material moisture content (%) = 5.23 % (No reliable surface soil moisture measurements are known for the area. Therefore, the average 2 inch depth soil moisture from Walnut Gulch, AZ NRCS Site # 2026 for the year of 2008 of 4.30% was adjusted for Nogales, AZ based on the average annual difference in rainfall between the two locations of 21.5% [Balling, 1988])
S	=	mean vehicle speed (mph) = 25 mph (Based on the typical unpaved road speed limit in Arizona)
k	=	Empirical Constant = 1.8 lb/VMT (EPA AP-42 Chapter 13.2.2, 2006)
a	=	Empirical Constant = 1 (EPA AP-42 Chapter 13.2.2, 2006)
c	=	Empirical Constant = 0.2 (EPA AP-42 Chapter 13.2.2, 2006)
d	=	Empirical Constant = 0.5 (EPA AP-42 Chapter 13.2.2, 2006)
C	=	0.00047 lb/VMT (EPA AP-42 Chapter 13.2.2, 2006)
P	=	number of days in a year with at least 0.254 mm (0.01 in) of precipitation = 45

Detailed TCM Calculations: Paving Unpaved Roads or Alleys [Sample]

Difference in Emissions Factors

Emissions Factor Paved (AEF) (g/mile)	-	Emissions Factor Unpaved (BEF) (g/mile)	=	Difference in Emissions Factors (g/mile)
0.382251788	-	255	=	-254.6177482

Daily Emissions Reductions = (BEF – AEF) x Miles x 0.93 x ADT x 1 /1000 (Kg/day)

Road Name	Difference in Emissions Factors (g/mile)	x	Length of Segment (miles)	x	Average Daily Traffic	=	PM_{10} Emissions Reductions (kg/day)
Road 1	-254.6177482	x	6	x	100	=	-142.08

Annual PM_{10} Emissions Reductions

Total Daily Emissions Reductions (kg/day)	x	Number of Days per Year (days/year)	=	Annual Emissions Reductions (kg/year)	Annual Emissions Reductions (tons/year)
-142.08	x	365	=	-51,858.00	-57.16

Annual $PM_{2.5}$ Emissions Reductions

Total Daily Emissions Reductions (kg/day)	x	Number of Days per Year (days/year)	=	Annual Emissions Reductions (kg/year)	Annual Emissions Reductions (tons/year)
-35.52	x	365	=	-12,964.50	-14.29

For Paving Unpaved Roads or Alleys:

Daily Emission Reductions = (BEF – AEF) * Miles * 0.93 * ADT * 1 /1000 (Kg/day)

Where:

BEF	=	The PM_{10} emission factor for vehicles traveling on unpaved roads or alleys
AEF	=	The PM_{10} emission factor for vehicles traveling on paved roads
Miles	=	The length of the project (in centerline miles)
ADT	=	The average weekday traffic on the unpaved road or alley
0.93	=	The factor to convert from weekday to annual average daily traffic on arterials.
0.25	=	Ratio of $PM_{2.5}/PM_{10}$

ATTACHMENT C

Air Quality Interagency Consultation and Data Checklist

Air Quality Conformity Analysis: Interagency Consultation Conference Call Meeting Minutes

[Date Time]

[Insert Interagency Consultation Group Meeting Minutes]

Attendees:

- XXX
- XXX
- XXX
- XXX
- XXX
- XXX
- XXX
- XXX

Meeting Minutes / Discussion Points:

- XXXXXX

Air Quality Data Checklist Summary [Sample]

Data Item	Inputs Assumptions
MOVES RunSpec	
Scale/Calculation Type	County Scale Inventory Run
Analysis County	Santa Cruz County (FIPS:4023)
Analysis Year	2008
Analysis Days/Months	July Weekday Annual (Convert July weekday results to annual values by multiplying by 315.38 days/year)
Pollutants	PM2.5, PM10, NOx
Stage II Refueling Emissions	Not Included
Fuel Types	Gasoline, Diesel, CNG
Traffic Data	
Highway Network	Use 2008 statewide travel model data provided by ADOT. Data are reformatted and additional fields are added to prepare PPSUITE-ready network databases.
County HPMS VMT Adjustments	Calculate AADT HPMS adjustments for 2008 to ensure VMT is consistent with reported 2008 HPMS total.
Seasonal Adjustments	Seasonal adjustments are not applied to model traffic volume. (Use MOVES day/month VMT fractions in MOVES run for seasonal adjustments).
Vehicle Mixes	MOVES VMT required by 6 HPMS vehicle classes. Use model traffic volume (by auto, SUT, MUT), and MOVES default VMT distributions for the state to split the three vehicle groups into MOVES 13 source types, which are recombined to the 6 HPMS vehicle classes.
MOVES Inputs	
Annual VMT	Calculated by PPSUITE from model / seasonal factors / vehicle mapping.
Avg. Hourly Speed Distribution	Calculated by PPSUITE (Minimum Speed = 2.5 mph).
Road Type Distribution	Calculated by PPSUITE; a RoadType field must be added to the travel model network based on FC.
Ramp Fraction	Calculated by PPSUITE (use ramp classes coded in model network).
Month VMT Fractions	Based on ADOT data.
Day VMT Fractions	Based on ADOT data.
Hour VMT Fractions	Calculated by PPSUITE. Factors to disaggregate daily traffic volumes by hour for different roadway functional classes. Use 2008 model network volume to calculate hourly distribution as inputs to PPSUITE.
Source Type Population	Based on ADOT data.
Vehicle Age Distribution	Based on ADOT data.
Fuel Parameters (Gasoline/Diesel/CNG)	Based on ADOT data and add MOVES default CNG fuel parameters.
I/M Parameters	No I/M programs.
Temperatures/Humidity	Based on ADOT data.
Control Programs	
Early NLEV/ CA LEV-II	Not Included
Stage II Refueling Parameters	Not Included

ATTACHMENT D

Sample MOVES
Data Importer (XML) Input File
and
Run Specification (MRS) Input File

[(Sample For 2008 July Weekday and Annual Runs)]

MOVES County Data Manager Importer File – July Weekday Run (MOVESIMPORTER.XML)

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MOVES Run Specification File – July Weekday Run (MOVESRUN.MRS)

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